primary mechanisms of aerobic respiration (fatty acid oxidation, citric acid cycle, respiratory chain, and oxidative phosphorylation) were carried out by a single, physically structured system of enzymes that he called the *cyclophorase system* (Green, Loomis, & Auerbach, 1948). His primary evidence that these enzymes constituted a structured system was his failure to isolate the enzyme catalyzing pyruvic to acetic acid using cell fractionation techniques. Instead, his preparation from rabbit kidney, which involved homogenation with potassium chloride using alkali to neutralize the acid that formed, followed by multiple resuspensions in saline and centrifugation, metabolized pyruvic acid all the way to carbon dioxide and water. By referring to a cyclophorase *system*, he meant to contrast the enzymes involved in aerobic respiration with those involved in other biochemical processes such as glycolysis, purine synthesis, and the pentose and urea cycles. In those cases, the enzymes can be isolated and an operative system reconstituted from the isolated components. He explained the term *cyclophorase* as "literally meaning the system of enzymes carrying through the (citric acid) cycle" (Green, 1951b, p. 17). Green acknowledged that the ending "ase" is usually applied to individual enzymes, but cited precedent for his extension to a "team of enzymes":

> Keilin and his school have been referring for more than two decades to the succinic oxidase and cytochrome oxidase systems. Neither the one nor the other represents a single enzyme. They represent a considerable group of enzymes all of which are associated with the same particulate elements. (1951b, pp. 17–18)

Green conceptualized the cyclophorase system as involving a precise physical arrangement that would facilitate cooperative action between spatially proximal enzymes. He also maintained that this arrangement would enable the components to behave in ways they could not otherwise: "the chemical organization by which the many constituent enzymes are integrated confers properties on the various enzymes which they may not necessarily enjoy when separated from the complex and isolated as single enzymes" (p. 18). Although he initially claimed that the cyclophorase system represented a newly discovered constituent of the cell,[9] after he learned of Lehninger's work Green accepted

talented team of researchers to the Institute who helped identify many of the critical aspects of both fatty-acid metabolism and oxidative phosphorylation. His own research, however, became increasingly suspect (his preparations of his cyclophorase system were contaminated with many other cell components) and his theorizing less grounded in experimental evidence than other researchers thought appropriate.

[9] Both Van Potter (Interview, 6 November 1987, Madison) and Helmut Beinert (Interview, 5 November 1987, Milwaukee) noted that Green had to be convinced that his cyclophorase system was linked to the mitochondrion.